

Exercise participation, body mass index, and health-related quality of life in women of menopausal age

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ABSTRACT

Background

Menopausal symptoms can affect women's health and wellbeing. It is important to develop interventions to alleviate symptoms, especially given recent evidence resulting in many women no longer choosing to take hormone replacement therapy. Exercise may prove useful in alleviating symptoms, although evidence on its effectiveness has been conflicting.

Aim

To examine the association between exercise participation, body mass index (BMI), and health-related quality of life in women of menopausal age.

Design of study

Survey of women of menopausal age.

Setting

West Midlands, England.

Method

Women aged 46–55 years ($n = 2399$) registered with six general practices in the West Midlands were sent a questionnaire containing items relating to demographics, lifestyle factors, weight, height, exercise participation, menopausal bleeding patterns, and health-related quality of life (including vasomotor symptoms).

Results

One thousand two hundred and six (50.3%) women replied. Women who were regularly active reported better health-related quality of life scores than women who were not regularly active ($P < 0.01$ for all significant subscales). No difference in vasomotor symptoms was recorded for exercise status. Women who were obese reported significantly higher vasomotor symptom scores than women of normal weight ($P < 0.01$). Women who were obese reported significantly higher somatic symptoms ($P < 0.001$) and attractiveness concern scores ($P < 0.001$) than women of normal weight or those who were overweight.

Conclusion

The data suggest a positive association between somatic and psychological dimensions of health-related quality of life and participation in regular exercise. Women with BMI scores in the normal range reported lower vasomotor symptom scores and better health-related quality of life scores than heavier women. Further evidence from high-quality randomised controlled trials is required to assess whether exercise interventions are effective for management of menopausal symptoms.

Keywords

body mass index; exercise; health-related quality of life; menopause.

INTRODUCTION

A high proportion of middle-aged women will experience vasomotor symptoms, such as hot flushes, due to changes in endogenous hormone levels.¹ Flushes and night sweats are of concern to women, and they can also disrupt sleep patterns and alter daily activities, which can lead to fatigue, irritability, and decreased quality of life.² Interventions that help women through the menopausal phase of their lives, such as engagement in regular exercise,³ are important for improving symptoms.⁴

The extent to which exercise may have a positive impact on vasomotor symptoms and subsequent quality of life in women who are menopausal is not known, although there are reasons for assuming that exercise may be useful. General population trials and reviews^{5,6} have found exercise to have a positive effect on menopausal-related health outcomes related to cognitive functioning, depression, sleep patterns, bone density, and cardiovascular diseases.

With a few notable exceptions,^{7,8} observational studies designed to address the association between exercise and menopausal symptoms have included small samples and have taken place before the

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availability of new evidence linking hormone replacement therapy (HRT) with adverse events. Several observational studies^{7–10} have been supportive of a positive relationship between exercise, vasomotor symptoms, and health-related quality of life in women of menopausal age, but findings have not always been consistent; several studies have reported no associations¹¹ or mixed findings.¹² Trials^{13,14} have examined the effects of exercise interventions on vasomotor symptoms but these have been of low quality, women with atypical presentations, and contained several methodological flaws and/or small samples, thus limiting the reliability of their conclusions.

Contradictory evidence exists regarding the effect of body mass index (BMI) on menopausal symptoms, particularly hot flushes. Some studies have reported that heavier women are at increased risk of experiencing hot flushes,^{8,15} whereas others have reported the opposite effect or no association.^{2,16} In terms of potential explanations, a high BMI implies greater amount of adipose tissue which converts adrenal androgens to oestrogens. This may, in turn, alleviate symptoms. In this way, exercise may increase vasomotor symptoms by reducing adipose tissue.

Other authors^{17,18} have proposed that exercise, (which theoretically should lower BMI), may have a similar effect to HRT in the amelioration of vasomotor symptoms by increasing the presence of peripheral serum levels of β -endorphins, and by stabilising the thermoregulatory centre, thereby reducing symptoms. These conflicting studies highlight the need for additional research.

Menopausal symptoms can affect women's health and wellbeing. Although HRT remains the most effective treatment for menopausal symptoms, acceptance and long-term continuation of HRT use is low.¹⁹ This has been the case, particularly since the publication of studies highlighting that HRT may be linked to an increased risk of particular diseases, including certain cancers.^{20–22} It is important, therefore, to investigate alternative interventions to alleviate these symptoms, such as exercise.

The primary aim of the study was to examine the simultaneous association between exercise participation, BMI, health-related quality of life, and vasomotor symptoms in women aged 46–55 years.

METHOD

Study participants and design

Purposeful sampling was used to select 10 general practices in the West Midlands, based on geographical location, Townsend deprivation score, and practice list size. Six practices agreed; their deprivation scores ranged from –3.5 to 9.4. Women aged 46–55 years who were registered with

How this fits in

There is some evidence for a positive association between exercise and health-related quality of life and mixed evidence for the alleviation of vasomotor symptoms in menopausal women. Most studies have included small samples and took place prior to recent evidence linking hormone replacement therapy with serious adverse events. No published study has taken place in the UK. There is conflicting data about the effect of BMI on vasomotor symptoms. This survey suggests that women of menopausal age who are regularly active may experience better health-related quality of life than those who are not regularly active. Women who were obese were found to report higher symptom scores than women with normal body mass index scores.

participating practices were invited to participate in the study.

A list of female patients aged 46–55 years was obtained from computerised records at each practice and a GP assessed the patient list to exclude inappropriate cases, for example, patients who were terminally ill. A GP invitation letter, containing a brief study description with a questionnaire booklet and freepost return envelope were mailed to eligible patients between February and April 2005. Replies were anonymous, and so reminder letters could not be sent.

Instruments

Demographic and lifestyle variables. Participants were asked to indicate their age. Ethnicity was determined using standard questions from the England and Wales 2001 Census.²³ Current smoking behaviour was assessed and a total sum weekly unit score for consumption was calculated. These items were required as sociodemographic variables. Lifestyle factors are considered important determinants for women's symptomatology and may modify experiences of symptoms.^{7,8}

Menopausal status was determined by asking participants a series of questions related to their menstrual bleeding patterns. Women were grouped into one of three categories based on responses:

- pre-menopausal (still having regular periods);
- peri-menopausal (irregular periods over previous year and participant believed they might have started the menopause); and
- menopausal/post-menopausal (no period in previous year because of natural or surgical menopause).

Participants who indicated they were peri-menopausal and menopausal/post-menopausal were asked if they were current users of HRT.

Exercise status (stage of change for exercise

behaviour). The stage of change ladder²⁴ – a visual semi-anchored, single-item rating scale – was used to assess participants' degree of involvement in regular exercise. The definition of exercise given was 'three or more times per week for 20 minutes or longer, of moderate intensity'. The labels at each stage represent the minimum requirements for membership of a particular stage of change. Scores on the ladder are categorised into one of five stages of change:

- 0 – pre-contemplation;
- 1 – contemplation;
- 2 – preparation;
- 3 – action; and
- 4 – maintenance.

For simplicity, participants were further classified as not regularly active (precontemplation, contemplation and preparation) or regularly active (action and maintenance), based on their responses.

Health-related quality of life. Participants completed the Women's Health Questionnaire (WHQ),²⁵ a subjective 36-item scale, designed to assess middle-aged women's perceptions of emotional and physical health. The WHQ includes nine

factors: depressed mood, memory/concentration problems, somatic symptoms, vasomotor symptoms, anxiety and fears, sleep problems, sexual dysfunction, menstrual symptoms, and attractiveness. Higher scores denote higher prevalence of a dimension.

Statistical analysis. Before examining the influence of exercise participation on WHQ subscales, a series of one-way multivariate analyses of variance (MANOVAs) were performed to identify possible covariate variables: comparisons between groups defined by alcohol consumption, menopausal status, HRT use, age category, and smoking status were conducted. The menstrual symptoms and sexual dysfunction subscales were omitted from these particular analyses as women were not required to complete these items if they were not applicable to them.

A series of two-factor (exercise status by BMI status) analyses of covariance (ANCOVA), with the covariates of age, alcohol consumption, menopausal status, and smoking behaviour were used to detect significant differences in WHQ subscales. Post-hoc Scheffe's tests were used to locate exact differences when appropriate; $P < 0.01$ was used as an indicator of significant differences between group means. It was estimated that 1200 completed questionnaires were required to estimate the outcomes measures with 3% precision at the 95% confidence level (CI).

RESULTS

Characteristics of the study population

An overall response rate of 50.3% (1206/2399) was obtained. A further 26 questionnaires were not completed and therefore not included in the analyses. The mean age of responders was 50.5 years (standard deviation [SD] = 2.8), of whom approximately half were post-menopausal with the remainder being pre- or peri-menopausal. The sample was predominately white (90.2%), with low alcohol consumption and did not smoke. Only 11.8% reported using HRT: 5.5%, 6.9%, and 17.7% in pre-, peri-, and post-menopausal women, respectively. Approximately half the sample was considered overweight or obese (Table 1). A total of 59.2% of the sample was categorised as not regularly active and 40.8% as regularly active.

Preliminary analyses

Multivariate effects were significant for menopausal status ($F_{[7,1040]} = 7.23$, $P < 0.001$), age category ($F_{[7,1053]} = 3.16$, $P < 0.01$), alcohol consumption ($F_{[7,1054]} = 1.78$, $P < 0.02$). These variables were subsequently used as covariates in the main study analyses.

Table 1. Prevalence statistics for demographics according to exercise status.

	Not regularly active		Regularly active	
	n	% ^a	n	% ^a
Age (years) (n = 1194)				
46–50	342	48.4	256	52.6
51–55	365	51.6	231	47.4
Menstrual status (n = 1198)				
Pre-menopausal	197	27.8	164	33.5
Peri-menopausal	164	23.1	101	20.6
Post-menopausal	348	48.7	224	45.8
HRT (n = 1196)				
HRT use	80	11.3	61	12.5
No HRT use	628	88.7	427	87.5
BMI (n = 1146)				
<25 (normal)	275	40.9	282	59.6
≥25–<30 (overweight)	226	33.6	139	29.4
≥30 (obese)	172	25.6	52	1.0
Smoking status (n = 1197)				
Non-smoker	572	80.8	427	87.3
Smokers	136	19.2	62	12.7
Ethnicity (n = 1191)				
White	632	89.8	443	91.0
Non-white	72	10.2	44	9.0
Alcohol (units p/w) (n = 1198)				
<1	301	42.5	258	36.4
≥1–≤7	77	0.9	73	10.3
>8–≤14	177	36.2	205	41.9
≥15	70	14.3	37	7.6

^aPercentages do not always add up to 100% due to rounding errors. BMI = body mass index. HRT = hormone replacement therapy.

Exercise status and health-related quality of life

No significant interactions were recorded. Regarding exercise status, analyses revealed significant effects favouring participants who were regularly active for depressed mood ($F_{[1,1070]} = 27.13$, $P < 0.001$), anxiety ($F_{[1,1094]} = 6.45$, $P < 0.01$), somatic symptoms ($F_{[1,1075]} = 14.34$, $P < 0.01$), and attractiveness concern scores ($F_{[1,1002]} = 8.73$, $P < 0.01$).

Data were analysed in accordance with each of the stages of change for exercise. Analyses revealed a similar pattern of significant effects to those reported, with the exception of anxiety scores. Specifically, women at the maintenance stage of change reported significantly lower depressed mood and somatic symptom scores than those at pre-contemplation ($P < 0.002$), contemplation ($P < 0.001$), and preparation ($P < 0.001$). Women at pre-contemplation also reported significantly higher attractiveness concern scores than women who were at the contemplation ($P < 0.001$), preparation ($P < 0.001$), action ($P < 0.001$), and maintenance ($P < 0.001$) stages of change (Table 2).

Body mass index and health-related quality of life

Significant BMI effects were found for the subscales vasomotor symptoms ($F_{[2,1109]} = 3.57$, $P < 0.03$), somatic symptoms ($F_{[2,1075]} = 5.10$, $P < 0.01$), and attractiveness ($F_{[2,1086]} = 18.10$, $P < 0.001$). Follow-up tests revealed that women who were obese reported significantly higher vasomotor symptoms ($P < 0.01$) scores than women of normal weight. Women who were obese also reported significantly higher somatic symptom scores than women of normal weight or those who were overweight (all $P < 0.01$). Women who were obese reported significantly higher attractiveness concern scores than women of normal weight and those who were overweight. Women who were overweight reported higher scores than women of normal weight in the attractiveness concern scores (Table 2).

DISCUSSION

Summary of main findings

Women who were regularly active reported better health-related quality of life than their less active counterparts. There was no significant difference in vasomotor symptom scores between participants who were active regularly and those who were not. It was also found that women who were obese reported higher vasomotor symptom scores than women of normal weight, and lower health-related quality of life scores than women of normal weight and those who were overweight.

Table 2. Exercise status, body mass index category, and health-related quality of life.

Symptom	Characteristics ^a				
	Exercise status		Body mass index status		
	Not regularly active	Regularly active	<25 (normal)	≥25–<30 (overweight)	≥30 (obese)
Depressed mood ^b					
Mean	0.33	0.23	0.26	0.28	0.31
Standard error	0.01	0.02	0.01	0.01	0.02
n	532	449	552	345	202
Somatic symptoms ^{b,c}					
Mean	0.51	0.40	0.45	0.46	0.53
Standard error	0.01	0.02	0.01	0.01	0.02
n	542	448	530	349	203
Memory/concentration					
Mean	0.56	0.53	0.51	0.54	0.59
Standard error	0.02	0.02	0.02	0.02	0.03
n	555	480	537	352	213
Vasomotor symptoms ^c					
Mean	0.53	0.50	0.47	0.51	0.58
Standard error	0.02	0.03	0.02	0.03	0.04
n	558	462	545	356	213
Menstrual problems					
Mean	0.45	0.41	0.41	0.43	0.45
Standard error	0.01	0.02	0.01	0.02	0.03
n	483	407	486	297	179
Anxiety/fears ^b					
Mean	0.38	0.32	0.35	0.35	0.37
Standard error	0.01	0.02	0.01	0.02	0.03
n	552	452	549	360	210
Sexual behaviour					
Mean	0.40	0.38	0.37	0.41	0.40
Standard error	0.02	0.03	0.02	0.02	0.04
n	420	343	431	272	143
Sleep problems					
Mean	0.52	0.47	0.48	0.50	0.51
Standard error	0.02	0.02	0.02	0.02	0.03
n	550	451	532	351	209
Attractiveness ^{b,c}					
Mean	0.58	0.50	0.45	0.53	0.65
Standard error	0.02	0.02	0.02	0.02	0.03
n	552	460	540	350	214

^aAdjusted means are presented, participant numbers varied for each analysis due to missing data. ^bStandard error ($P < 0.001$) for exercise status. ^cStandard error for body mass index category ($P < 0.05$).

Strengths and limitations of the study

It is not possible to determine from observational study designs whether women reported better health-related quality of life scores because they were active or whether they were less active because they were symptomatic. Exercise participation was measured by self-report and individuals tend to overestimate this. The simple classification of women as regularly active or not regularly active on the basis of their stage of change for exercise score may be considered somewhat crude, although sensitivity analyses

confirmed this did not alter the main findings.

It is possible that the findings of the study could be explained by the self-selection of healthy women responding to the questionnaire. However, a large proportion of responders were women who were sedentary/not regularly active and/or were overweight or obese. These proportions are concordant with the Million Women Study,²² which reported that 65% of women in their sample exercised once per week or less, or not at all.

Although the overall response rate was relatively low, the age distribution (50.4% = 46–50 years; 49.6% = 51–55 years) and ethnicity distribution (non-white = 9.6%) of the sample coincides with data from the West Midlands region 2001 Census for this age group (48% = 45–49 years; 52% = 50–54 years, 8% of non-white ethnicity).²³ Thus, despite a low response rate, our data should be less prone to bias regarding these variables.

The strengths of the study are that a number of factors known to influence both symptoms and exercise participation were controlled in the analyses and that a much larger sample was included, when compared with many previous studies. To the best of our knowledge this is the first British study to focus specifically on these outcomes in a sample of women of menopausal age.

Comparison with existing literature

Unlike some studies,^{7–10} but similar to others,^{11,12} exercise participation was not significantly associated with vasomotor symptoms, although it was associated with some dimensions of health-related quality of life. It is interesting to note that exercise was not related to an increase of vasomotor symptoms, which is not inconceivable given that the process of exercise typically causes individuals to produce heat and sweating/perspiration. This may be one reason why some women of menopausal age avoid doing exercise.

It is also possible that the relationship between exercise and menopausal symptoms is mediated by exercise intensity, as it has been suggested that the production of β -endorphins is more likely to occur during high-intensity rather than low-intensity exercise.²⁶ Middle-aged women are more likely to engage in low- to moderate-intensity exercise than vigorous forms,²⁷ which may explain the lack of significant relationships for vasomotor symptoms and other WHQ subscales. Despite these issues, the positive association between exercise and the other health-related quality of life outcomes should not be underestimated, particularly for somatic symptoms, which typically also cause a great deal of distress and discomfort to women who are menopausal. The findings for the somatic and psychological

dimensions of health-related quality of life in the present study are in line with previous research.⁷

Similar to past research,^{8,15} data indicate that women who were obese reported higher vasomotor symptom scores and lower health-related quality of life scores than women with normal BMI scores. A recent longitudinal study²⁸ has documented that increases in weight of more than 5kg were associated with significant increases in somatic symptoms.

The use of HRT in the sample was low (11.8%), which provided the opportunity to examine the outcomes of interest in a sample largely free of hormonal treatment. The prevalence of HRT use in the UK increased steadily¹⁹ in the 25 years prior to the publication of several major studies, including trials that reported adverse effects of HRT.^{20–22} In post-menopausal women alone, the prevalence of HRT was 17.7%, considerably lower than the figures recorded some years earlier by the Million Women Study (33%)²² and the UK General Practice Research Database²⁹ (27% in 1996; 28% in 1997–1998). The role of exercise as an alternative to HRT may become more critical in the coming years because large numbers of women are no longer choosing to use HRT.

Implications for future research

The menopause transition can represent a 'teachable moment' in women lives, a time for women to consider ways to improve their overall health status. High-quality trials that examine the effects of exercise on menopausal symptoms is urgently required. Although exercise was not associated with vasomotor symptoms, it was associated with fewer psychological and psychosomatic health problems which can affect women of menopausal age. Furthermore, women who were obese reported higher vasomotor symptom scores than women who displayed normal BMI scores. The examination of exercise as an alternative to HRT is timely given women's changing attitudes towards HRT.

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Ethics committee

Ethical approval for the study was gained from the South Birmingham Local Research Ethics Committee (reference number 04/Q2704/37)

Competing interests

The authors have stated that there are none

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